

Claims

1. A communications system comprising a first data processing apparatus, a second data processing apparatus, and a tunnel managing apparatus,

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the first data processing apparatus including:

a first tunnel communication unit for conducting a tunnel communication;

10 a sustain data receiving unit for receiving a sustain data for sustaining the tunnel communication; and

a tunnel communication controlling unit for controlling the tunnel communication conducted by the first tunnel communication unit with the sustain data received by the sustain data receiving unit,

15 the second data processing apparatus including:

a second tunnel communication unit for conducting the tunnel communication with the first data processing apparatus, and

the tunnel managing apparatus including:

20 a tunnel communication data managing unit for managing a tunnel communication data about the tunnel communication between the first data processing apparatus and the second data processing apparatus; and

25 a sustain data transmitting unit for transmitting the sustain data to the first data processing apparatus in response to the tunnel communication data.

2. A data processing apparatus comprising:

a tunnel communication unit for conducting a tunnel communication;

5 a sustain data receiving unit for receiving a sustain data for sustaining the tunnel communication; and a tunnel communication controlling unit for controlling the tunnel communication conducted by the first tunnel communication unit with the sustain data received by the 10 sustain data receiving unit.

3. A data processing apparatus according to claim 2, further comprising:

15 a sustain data demanding unit for demanding transmission of the sustain data, wherein the sustain data received by the sustain data receiving unit is transmitted when demanded by the sustain data demanding unit.

20 4. A data processing apparatus according to claim 3, wherein the sustain data demanding unit demands the transmission of the sustain data at intervals of a predetermined time.

25 5. A data processing apparatus according to claim 3 or 4, wherein

the sustain data carries a tunnel sustaining time data indicative of the tunnel sustaining time for sustaining the tunnel communication, and

5 the sustain data demanding unit demands the transmission of the sustain data in response to the tunnel sustaining time data in the sustain data received by the sustain data receiving unit.

10 6. A data processing apparatus according to any of claims 2 to 4, wherein the tunnel communication controlling unit terminates the tunnel communication conducted by the tunnel communication unit when the sustain data receiving unit receives the sustain data indicating that the tunnel communication is no more sustained.

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7. A data processing apparatus according to any of claims 2 to 4, further comprising:

20 a tunnel control data transmitting unit for transmitting a tunnel control data for demanding an extension of the available time in which the tunnel communication is sustained.

8. A tunnel managing apparatus comprising:

25 a tunnel communication data managing unit for managing a tunnel communication data about a tunnel communication between two or more processing apparatuses; and

a sustain data transmitting unit for transmitting a sustain data for sustaining the tunnel communication to the apparatus conducting the tunnel communication in response to the tunnel communication data.

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9. A tunnel managing apparatus comprising:

a tunnel communication data managing unit for managing a tunnel communication data about a tunnel communication between two or more processing apparatuses; and

10 a sustain data transmitting unit for transmitting a sustain data for sustaining the tunnel communication in response to the tunnel communication data.

15 10. A tunnel managing apparatus according to claim 8 or 9, further comprising:

a demand receiving unit for receiving a demand for transmission of the sustain data, wherein

the sustain data transmitting unit transmits the sustain data in response to the demand for transmission of the sustain data received by the demand receiving unit.

20 25 11. A tunnel managing apparatus according to claim 10, further comprising a demand saving unit for saving the demand for transmission of the sustain data received by the demand receiving unit.

12. A tunnel managing apparatus according to claim 8
or 9, wherein, the tunnel sustain data transmitting unit
transmits the sustain data for not sustaining the tunnel
communication when it is judged from the tunnel
5 communication data that the tunnel communication is no more
sustained.

13. A tunnel managing apparatus according to claim 8
or 9, wherein
10 the tunnel communication data carries a data for charging
the payment of the tunnel communication and
the sustain data transmitting unit transmits the sustain
data in response to the data for charging the payment.

15 14. A tunnel managing apparatus according to claim 8
or 9, further comprising:
a control data receiving unit for receiving a tunnel
control data for controlling the tunnel communication; and
20 a data modifying unit for modifying the tunnel
communication data managed by the tunnel communication data
managing unit in accordance with the tunnel control data.

15. A tunnel managing apparatus according to claim 14,
further comprising:
25 a modification judging unit for judging from the tunnel
control data whether or not the tunnel communication data

is to be modified when the control data receiving unit receives
the tunnel control data,

wherein

the data modifying unit modifies the tunnel communication

5 data in accordance with the tunnel control data when the
modification judging unit judges that the tunnel communication
data is to be modified.

16. A tunnel managing apparatus according to claim 14,

10 wherein the tunnel control data is a data for demanding an
extension of the available time in which the tunnel
communication is sustained.

17. A data processing system comprising a tunnel managing

15 apparatus and an access apparatus,

the access apparatus including:

a first demand receiving unit for receiving a demand
for transmission of a sustain data for sustaining a tunnel
communication between two or more processing apparatuses;

20 a demand transmitting unit for transmitting the
demand for transmission to the tunnel managing apparatus
when the first demanding receiving unit receives the demand
for transmission;

25 a sustain data receiving unit for receiving the
sustain data transmitted from the tunnel managing apparatus;
and

a first sustain data transmitting unit for transmitting the sustain data when the sustain data receiving unit receives the sustain data, and
the tunnel managing apparatus including:

5 a tunnel communication data managing unit for managing a tunnel communication data about the tunnel communication;

a second demand receiving unit for receiving the demand for transmission from the access apparatus; and

10 a second sustain data transmitting unit for transmitting the sustain data to the access apparatus in response to the tunnel communication data when the second demand receiving unit receives the demand for transmission.

15 18. A data processing system according to claim 17,
wherein

the access apparatus further includes:

a control data receiving unit for receiving a tunnel control data about controlling the tunnel communication;

20 and

a control data transmitting unit for transmitting the tunnel control data to the tunnel managing apparatus when the control data receiving unit receives the tunnel control data, and

25 the tunnel managing apparatus further includes:
a control data receiving unit for receiving the

tunnel control data transmitted from the access apparatus;

and

5 a data modifying unit for modifying the tunnel communication data managed by the tunnel communication data managing unit in accordance with the tunnel control data.

19. A data processing system according to claim 17 or 18, further comprising:

10 a modification judging unit for judging from the tunnel control data whether or not the tunnel communication data is to be modified when the control data receiving unit receives the tunnel control data,

wherein

15 the control data transmitting unit transmits the tunnel control data to the tunnel managing apparatus when the modification judging unit judges that the tunnel communication data is to be modified.

20 20. A data processing system according to claim 17 or 18, wherein the tunnel control data is a data for demanding an extension of the available time in which the tunnel communication is sustained.

25 21. A tunnel managing apparatus provided in the data processing system defined in claim 17 or 18.

22. An access apparatus provided in the data processing system defined in claim 17 or 18.

23. A data processing method comprising:

5 a sustain data receiving step of receiving a sustain data for sustaining a tunnel communication; and a tunnel communication controlling step of controlling the tunnel communication in response to the sustain data received at the sustain data receiving step.

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24. A tunnel managing method comprising:

a sustain data transmitting step of transmitting a sustain data for sustaining a tunnel communication to the apparatus conducting the tunnel communication in response 15 to a tunnel communication data about a tunnel communication between two or more apparatuses.

20 25. A tunnel managing method comprising:

a sustain data transmitting step of transmitting a sustain data for sustaining a tunnel communication in response 25 to a tunnel communication data about a tunnel communication between two or more apparatuses.

26. A tunnel managing method according to claim 25,

further comprising:

a demand receiving step of receiving a demand for

transmission of the sustain data, wherein
the sustain data is transmitted at the sustain data
transmitting step when the demand for transmission is
received at the demand receiving step.

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27. A data processing method comprising:

a demand receiving step of receiving a demand for
transmission of a sustain data for sustaining a tunnel
communication between two or more apparatuses;

10 a demand transmitting step of transmitting the demand
for transmission when the demand for transmission is received
at the demand receiving step;

a sustain data receiving step of receiving the sustain
data; and

15 a sustain data transmitting step of transmitting the
sustain data when the sustain data is received at the sustain
data receiving unit.

28. A program for making a computer to execute:

20 a sustain data receiving step of receiving a sustain
data for sustaining a tunnel communication; and
a tunnel communication controlling step of controlling
the tunnel communication in response to the sustain data
received at the sustain data receiving step.

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29. A program for making a computer to execute a sustain

data transmitting step of transmitting a sustain data for sustaining a tunnel communication to the apparatus conducting the tunnel communication in response to a tunnel communication data about a tunnel communication between two 5 or more apparatuses.

30. A program for making a computer to execute a sustain data transmitting step of transmitting a sustain data for sustaining a tunnel communication in response to a tunnel 10 communication data about a tunnel communication between two or more apparatuses.

31. A program according to claim 30, further making a computer to execute a demand receiving step of receiving a demand for transmission of the sustain data, wherein 15 the sustain data is transmitted at the sustain data transmitting step when the demand for transmission is received at the demand receiving step.

32. A program for making a computer to execute: 20 a demand receiving step of receiving a demand for transmission of a sustain data for sustaining a tunnel communication between two or more apparatuses; a demand transmitting step of transmitting the demand 25 for transmission when the demand for transmission is received at the demand receiving step;

a sustain data receiving step of receiving the sustain data; and

a sustain data transmitting step of transmitting the sustain data when the sustain data is received at the sustain data receiving unit.